FINAL REPORT

Grant NSG-7429

RESEARCH ON LUNAR MARE EMPLACEMENT AND IMPACT CRATERING EXPERIMENTS

submitted by

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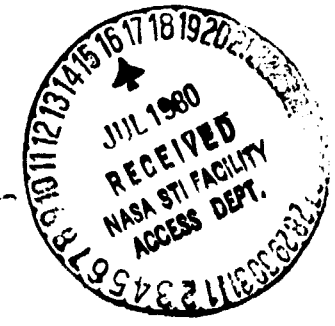

July 10, 1980

RESEARCH ON LUNAR MARE EMPLACEMENT AND IMPACT CRATERING ENVIRONMENT

I. Objectives:

Task 1. To determine the modes of emplacement and styles of volcanism for selected mare and related units on the Moon through a combination of photogeology and other remote sensing methods, field analog studies, and consideration of lunar sample data.

Task 2. To carryout a series of impact cratering experiments at the NASA Ames Research Center Vertical Ballistic Gun Facility, using viscous targets.

Task 3. To participate in the Basaltic Volcanism Project at the Lunar and Planetary Science Institute.

II. Summary

The general objectives of the grant have been met and the results reported at national meetings and published (or are in press) in various journals as indicated in the "References" and attached herewith.

The results for Task 1 consist of the derivation of a model enabling the interpretation of lunar styles of volcanism through the analysis of various surface features. The model has been applied to several areas on the Moon, including the Orientale Basin, the Smythii Basin, the Herigonious region, and several highland areas. Concurrent with the application of the model, several topical studies of various aspects of lunar volcanism were completed. In general, lunar volcanism is much more complex and varied than originally considered, with different styles of volcanism operating as a function of geologic time and geographic location.

In Task 2, a series of impact crater experiments was conducted at NASA Ames involving viscous targets. The objective was to determine the effect that viscous targets would have on cratering mechanics and morphology for application in studies of martian ejecta flow craters. The results of the experiments led to a model that can account for the formation of multiple flow lobes and the general morphology of some aspects of martian craters.

For Task 3, the Principal Investigator served as a member of Team Five (Morphology) of the Basaltic Volcanism Project and contributed toward the writing of the team report for final publication.

III. Publications

The following publications resulted wholly or in part from the support of the subject grant:

Greeley, R. (1976). Modes of emplacement of basalt terrains and an analysis of mare volcanism in the Orientale Basin. Proc. Lunar Sci. Conf. 7th, 2747-2759.

Schultz, P.H., R. Greeley and D. Gault (1976). Degradation of small mare surface features. Proc. Lunar Sci. Conf. 7th, 985-1003.

Gault, D.E. and R. Greeley (1978). Exploratory experiments of impact craters formed in viscous-liquid targets: Analogues for martian rampart craters? Icarus, 34, 486-495.

Schultz, P.H. and P.D. Spudis (1978). The dark ring of Orientale: Implications for pre-basin mare volcanism and a clue to the identification of the transient cavity rim (abstract). Lunar Planet. Sci. Conf. IX, 1033-1035.

Spudis, P.D. (1976). Composition and origin of the Apennine Bench formation (abstract). Lunar Planet. Sci. Conf. IX, 1086-1088.

Spudis, P.D. (1976). Origin and distribution of KREEP in Apollo 15 soils (abstract). Lunar Planet. Sci. Conf. IX, 1089-1091.

Greeley, R. and P. Spudis (1978). Mare volcanism in the Herigonius region of the Moon. Proc. Lunar Planet. Sci. Conf. 9th, 3333-3349.

Spudis, P.D. (1978). Composition and origin of the Apennine Bench Formation. Proc. Lunar Planet. Sci. Conf. 9th, 3379-3394.

Schultz, P.H., P.D. Spudis and D. Sellers (1979). Evidence for ancient lunar basalts (abstract). Lunar Planet. Sci. Conf. X, 1084-1086.

Schultz, P.H. and P.D. Spudis (1979). Evidence for ancient mare volcanism. Proc. Lunar Planet. Sci. Conf. 10th, 3899-2918.

Greeley, R. and D. Gault (1979). Endogenic craters of basaltic lava flows: Size frequency distribution. Proc. Lunar Planet. Sci. Conf. 10th, 2919-2933.

Hawke, B.R. and P.D. Spudis (1979). Chemical mixing model studies of lunar basin ejecta deposits (abstract). Proceedings of Conference on the Lunar Highlands Crust, pp. 53-55. Lunar and Planetary Institute, Houston.

Hawke, B.R., P.D. Spudis, and P.E. Clark (1979). Geochemical anomalies on the lunar eastern limb and farside (abstract). Proceedings of Conference on Lunar Highlands Crust, pp. 56-58. Lunar and Planetary Institute, Houston.

Ryder, G. and P.D. Spudis (1979). Volcanism prior to the termination of the heavy bombardment: Evidence, characteristics and concepts (abstract). Proceedings of Conference on the Lunar Highlands Crust, pp. 132-134. Lunar and Planetary Institute, Houston.

Spudis, P.D. (1979). The extent and duration of lunar KREEP volcanism (abstract). Proceedings of Conference on Lunar Highlands Crust, pp. 157-159. Lunar Planetary Institute, Houston.

Greeley, R., J. Fink, D.E. Gault, D.B. Snyder, J.E. Guest and P.H. Schultz (1980). Impact cratering in viscous targets: Laboratory experiments. Proc. Lunar Planet. Sci. Conf. XI, (in press).